

REMARKS

The specification has been amended to correct grammatical and idiomatic errors contained therein. No new matter has been added. The abstract has been amended to state possible utilities for the double oxide powder produced by the claimed invention. However, Applicants wish to point out that the originally presented abstract clearly complied with USPTO requirements and that the language quoted by the Examiner in the Office Action with respect to the abstract is only suggestive and not mandatory. If the Examiner still is not satisfied with the abstract after Applicants' amendment thereof, he is respectfully requested to amend the abstract to include language that the Examiner deems satisfactory by Examiner's Amendment.

In order to respond to the Examiner's rejection under 35 USC 112, second paragraph, and to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention, Claim 1 has been canceled and replaced by newly presented Claim 6. No new matter has been added. It is respectfully submitted that the currently claimed invention clearly complies with 35 USC 112.

Claims 1-5 have been rejected under 35 USC 102(b) as being anticipated by or, in the alternative, under 35 USC 103(a) as being obvious over Japan Patent Document No. 10-182161, hereinafter referred to as JP '161. Claims 1-4 have been rejected under 35 USC 102(b) as being anticipated by or, in the alternative, under 35 USC 103(a) as being obvious over Takatori et al. Claims 1-4 also have been rejected under 35 USC 102(b) as being anticipated by or, in the alternative, under 35 USC 103(a) as being obvious over Laine et al. Applicants respectfully traverse these rejections and urge reconsideration in light of the following comments.

The presently claimed invention is directed to a method for manufacturing a highly-crystallized double oxide powder composed of a single crystal phase. This method comprises the

steps of forming a raw material solution containing a raw material compound that includes at least two elements selected from at least one metal element and at least one semi-metal element that constitutes a double oxide, subjecting a dried sample of the raw material solution to TG-DTA analysis to determine if only one main peak is produced by a decomposition reaction of the raw material compound or a reaction intermediate thereof and, if the TG-DTA analysis indicates that only one main peak is produced, forming droplets of the raw material solution and heating the droplets at a temperature sufficient to produce the double oxide powder.

As discussed in the present specification, the present invention includes a means for predicting the ideal composition of a raw material solution used to manufacture a product highly-crystallized double oxide powder consisting of a single crystal phase and a single step using spray pyrolysis. When the raw material solution is prepared, a sample of the solution is tested to see if only one main peak attributable to the decomposition reaction of the raw material compound, or a reaction intermediate thereof, is present in a DTA profile when the solution is dried and solidified and subjected to a TG-DTA measurement. If only one main peak is produced, the raw material solution is then used to produce the highly-crystallized double oxide powder composed of a single crystal phase. By performing the TG-DTA analysis, it is determined whether the raw material solution is suitable for producing the double oxide powder of the present invention. It is respectfully submitted that the prior art cited by the Examiner does not disclose the presently claimed invention.

JP '161 discloses a method for the production of a water-soluble lithium-manganese double oxide by reacting a compound containing a metal element making up a lithium-manganese double oxide with a polyol and an oxypolycarboxylic acid to form a water-soluble carboxylic ester complex oligomer, dissolving the reaction product in water and spray-heating the

solution of the resultant product. This reference has no disclosure with respect to conducting a TG-DTA measurement prior to the pyrolysis step or the advantages associated therewith. As set forth in paragraph [0006] of this reference, JP '161 requires a composite polymer of the metal complex to be synthesized prior to the pyrolysis step and for this polymer to be redissolved. In contrast thereto, the method of the present invention can be performed by forming droplets of a raw material solution having the composition optimized through the TG-DTA measurement and DTA profile and heating these droplets at a temperature sufficient to form a double oxide powder without requiring a complicated step of forming a water-soluble carboxylic ester complex oligomer.

In the instant invention, once it has been determined that an optimized composition is present by the TG-DTA analysis, the double oxide product can be obtained from the raw material solution by a simple procedure regardless of whether or not the intermediate or reaction complex products as required by JP '161 are formed or not. The present invention requires a step of analyzing the raw material solution by TG-DTA analysis prior to the formation of the double oxide powder. JP '161 has no such disclosure and, as such, it is respectfully submitted that the presently claimed invention clearly is patentably distinguishable thereover.

The Takatori et al reference discloses a method for producing an active material powder for lithium secondary batteries. The active material powder is formed of a spinel oxide containing lithium or a layer-structured oxide containing lithium. A suspension or an emulsion of the active material is atomized in the form of droplets in an oxygen atmosphere and the droplets heated by burning the combustible liquid and causing the ingredients to react to form the spinel oxide containing lithium. However, like the previously discussed reference, there is no discussion in this reference regarding performing TG-DTA analysis of the raw material solution to determine if only one main peak is produced prior

to conducting the spray pyrolysis of the raw material solution. Therefore, like the previously discussed reference, it is respectfully submitted that the presently claimed invention is patentably distinguishable over Takatori et al.

The Laine et al. reference discloses the preparation of ultrafine metal oxide and mixed metal oxide ceramic particles by flame spray pyrolysis of a ceramic precursor solution containing one or more glycolato polymetallooxanes dissolved in a volatile organic solvent. Like the previously discussed references, there is no disclosure in this reference regarding the subjecting of a dry sample of the raw material solution to TG-DTA analysis to determine if only one main peak is produced by a decomposition reaction of the raw material compound or reaction intermediate thereof and performing the spray pyrolysis if the TG-DTA analysis indicates that only one main peak is produced. As such, it is respectfully submitted that for the reasons advanced above, the presently claimed invention is patentably distinguishable over Laine et al.

Although the references cited by the Examiner do not even make a showing of prima facie obviousness under 35 USC 103(a), Applicants respectfully submit that objective evidence is of record which would be more than sufficient to rebut any proper showing of prima facie obviousness under 35 USC 103(a).

In the present specification, Examples of the present invention are tested with Comparative Examples outside of the scope of the present claims. Example 2 and Comparative Examples 4 and 5 all use a material solution containing three metal compounds, citric acid and monoethylene glycol. Citric acid and monoethylene glycol are the oxypolycarboxylic acid and polyol added to the metal compound to form the compound carboxylic ester complex oligomer shown in JP '161. Of the material compound solutions of the three Examples, the main compound solution of Example 2 shows a single main peak in Figure 5 and results in a double oxide powder having a single phase and high crystallinity while the material compound solutions of Comparative Examples 4 and 5 show two main peaks

and three main peaks in Figures 6 and 7, respectively, and result in double oxide powders having plural phases. An additional comparison between Example 1 of the present invention and Comparative Examples 1-3 illustrate the effects of the inventive method using the optimized composition of the material compound solution over the Comparative Examples. There is no disclosure in the references cited by the Examiner for optimizing the composition of the raw material solution. Therefore, for the reasons advanced above, it is respectfully submitted that the presently claimed invention clearly is patentably distinguishable over the prior art cited by the Examiner. The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Respectfully submitted,



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